

A New *Blattisocius* (Acarina: Mesostigmata) from Noctuid Moths

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Abstract: *Blattisocius patagiorum* is distinguishable from previously described species by the slender, edentate form of the movable cheliceral digit in nymphs and females. Males possess an accessory organ lateral to each peritreme. Behavior suggests facultative parasitism upon noctuid moths.

The six previously known species of the ascid genus *Blattisocius* have been recorded (Chant, 1963) from a great variety of habitats, including association with insects in stored grains. Evans (1958) reported *B. dentriticus* (Berlese) from the thorax of a noctuid moth, *Caradrina morpheus* (Hüfn.), taken in Darlington, Yorkshire, England, but he gave no details regarding its relationship to the host. The species here described has been found on several noctuids under circumstances that provided an unusual opportunity for detailed observations on certain aspects of its behavior and reproduction.

Genus *Blattisocius* Keegan, 1944

Blattisocius patagiorum n. sp.

This species differs from others of the genus in the slender, wholly edentate form of the movable digits of the chelicerae in nymphs and females. The peritremes of the female are a little longer than those of *B. keegani* Fox, but shorter than those of *B. tarsalis* (Berlese). The length of the fixed cheliceral digits is also intermediate as between these species, being longer than that of *B. tarsalis*, but shorter than that of *B. keegani*.

FEMALE In the six specimens at hand, the length of the dorsal shield varies from 530 to 570 μ , averaging 546. Its variation in width is from 258 to 280, with an average of 267 μ . It is lightly reticulated in all areas, and bears 33 pairs of setae. The average length of seta j6, which is typical of the dorsocentral series, is 48 μ . Setae J4, J5, and Z5 are very finely serrate; the others are simple. Dorsally, the soft integument bears 19 pairs of setae (Fig. 1a).

The tritosternum (Fig. 2a) is about 72 μ long and is undivided in its basal three fourths; the laciniae are finely plumose. The sternal shield is lightly reticulate. The fourth sternal setae are on the membrane. Anteromedial to them are minute metasternal plates bearing pores. The genital shield is about as wide as the sternal shield. Its side margins are concave and its rear margin truncate. The genital setae are on the edges of the shield, the paragenital "pores" in small plates at its sides. There are two pairs of elongate metapodal plates. The ventrianal shield is roughly rectangular and lightly reticulate. It bears three pairs of preanal setae. Five pairs of setae are based upon the soft ventral integument. The peritremes extend to about the middle of coxae III. The peritremal shields are broadly joined to the exopodal plates embracing coxae IV. There are prominent exopodal plates flanking coxae II and III, but endopodal plates are lacking. The spermathecae are as shown in Fig. 2b.

The tectum or epistome is smooth and convex anteriorly (Fig. 1b). The movable digits of the chelicerae taper smoothly to their pointed tips, and are without teeth (Fig. 2c). They average 33 μ in length. The fixed digits are about three fifths this length, smooth, and provided with a pilus dentilis. The corniculi (Fig. 2d) are slender and approximated.

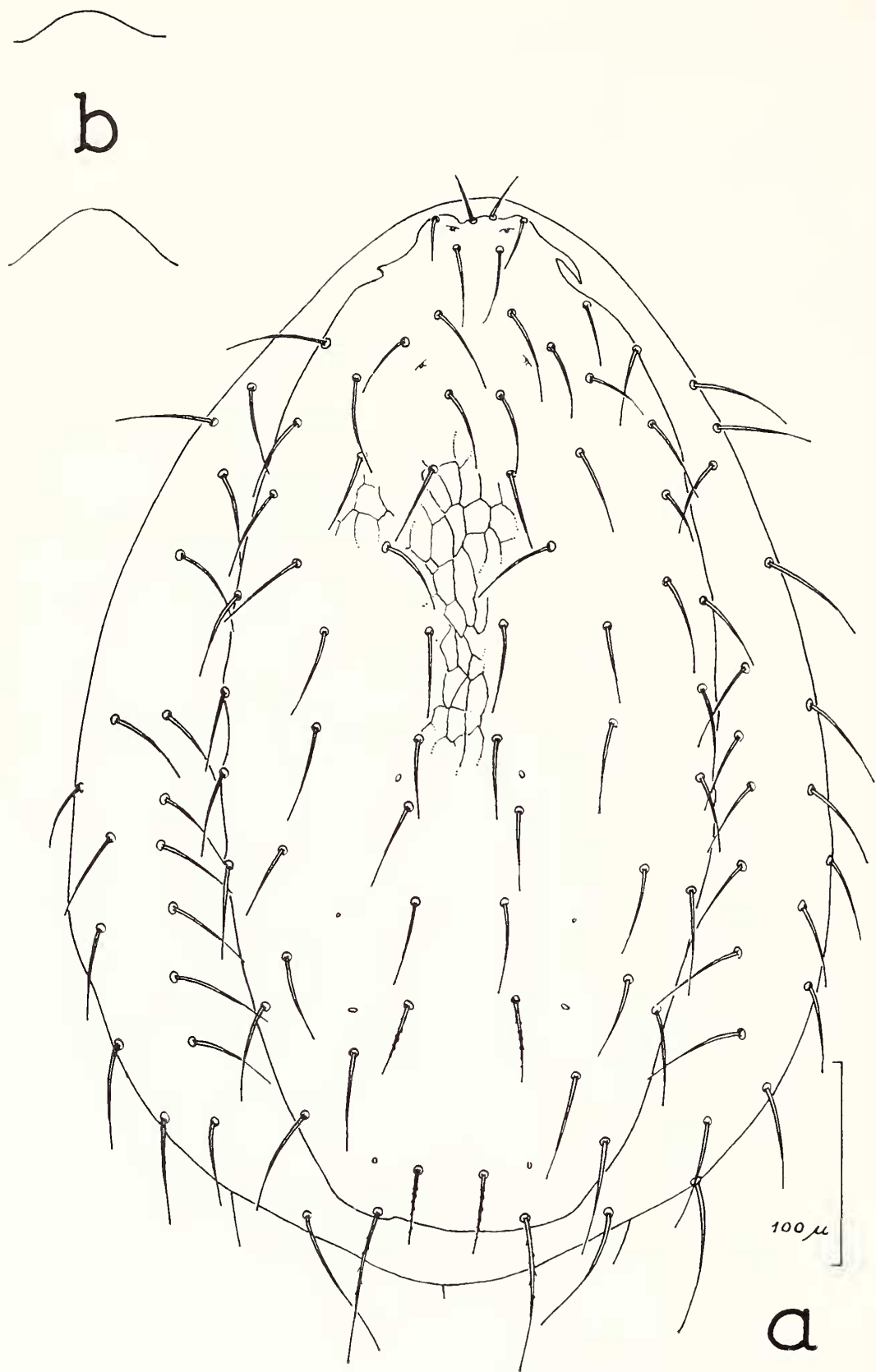


FIG. 1. *Blattisocius patagiorum* n. sp.; a, dorsal surface of idiosoma of holotype female; b, epistome (tectum), showing variation in form.

Deutosternal denticles form a narrow series of seven "rows," with a single denticle in each except the sixth, which may have two. The palpi are normal for the genus.

Average leg lengths in microns are: I, 528; II, 422; III, 412; IV, 535. Setation conforms to that given for the genus by Lindquist and Evans (1965). Macrosetae are not present.

The legs turn somewhat brown with age, but do not become so conspicuously tanned as in *B. tarsalis*.

MALE In the five specimens studied the dorsal shield varies in length from 408 to 452 μ , and in width from 227 to 250. Average length and width are 430 and 236 μ . The reticular pattern resembles that of the female. There are 33 or 34 pairs of setae on the shield and 11 or 12 pairs on the soft dorsal integument. Setae J3, J4, J5, and Z5 are very slightly serrate (Fig. 3a).

The tritosternum (Fig. 3b) is about 60 μ long, and is divided for about half its length. The sternogenital shield is elongate, with lateral projections anterior and posterior to coxae II. It bears four pairs of setae and is flanked by the genital pair near its posterior end. The ventrianal shield is broadly triangular and lightly reticulate. In some specimens it bears five, in others six pairs of preanal setae.

The exopodal and peritremal shields are similar to those of the female, but dorsolateral and slightly anterior to each peritreme is a structure which I shall refer to as an accessory organ (Fig. 3c). In the most favorably oriented specimen, this appears to lie beneath or within a cuticular fold or pouch (Fig. 4a). The accessory organ is surrounded by a broadly oval plate with tapering anterior and posterior extensions that run parallel to and may join the peritremal plate toward their extremities. Enclosed by this plate is a cigar-shaped, transparent tube or trough with fine transverse ridges or folds projecting into its interior from its median border (Fig. 4b). It is about equal to the peritreme in length and width. Such a structure was mentioned and figured by Oudemans (1929) and is figured, from Oudemans' Plate 104, by Nesbitt (1951) in his drawing of the male of *B. tarsalis* (as *tineivorus* Oud.). Oudemans compares it to a piece of a peritreme, and says that he has never seen anything like it. Keegan (1944) also figured this part of the organ in his description of *B. tarsalis* (as *triodons*), but mentioned it no further than to say that in the male the "peritremal plate differs from that of the female." In *B. patagiorum*, however, the transverse ridges produce a distinctly striated and not punctate appearance as figured in Nesbitt and by Keegan. The accessory organ differs in this respect from the peritreme, which does indeed appear punctate. As one focuses on the deeper, more dorsally situated parts of the organ, the ridges disappear, and the outlines change to a form which curiously resembles that of a canoe or gondola with elevated and projecting prow and stern (Fig. 4c). The "prow" and "stern" projections taper to blunt points, or in some specimens to apparently open ends, with the tapered portion at the anterior end occasionally showing some suggestion of coiling. The accessory organ seems to have no connection to the peritreme other than that of proximity. Its restriction to the male suggests a sexual function, possibly as a sensory organ or as a scent releaser. It occurs in the males of *B. keegani*, as well as in those of *B. tarsalis*, but is not found in *B. dentriticus*. I have not seen males of the other species of *Blattisocius*.

The gnathosoma of the male resembles that of the female except for being relatively shorter and broader, and for having the corniculi more widely separated at their bases. The spermatodactyl is as shown in Fig. 3d, e. Leg lengths average 434, 343, 335, and 437 μ for legs I to IV respectively. Leg setation is like that of the female.

EARLY STAGES The eggs are laid singly and adhere only lightly to the substrate. They are smooth, firm, pearly white, and subcylindrical, measuring about 254 by 188 μ . Empty egg cuticula retain the shape of the egg. Larvae and nymphs are in most respects typical for the genus as described by Lindquist and Evans (1965). The larval cuticle is unstriated. The area corresponding roughly with that of the future peritremal shields is covered with coarse granulations or cuticular bosses (Fig. 5a, b). The movable digits of the larval chelicerae are short and broad based, but as in all subsequent stages, without teeth. There is a pair of trumpet-shaped organs in the ventral integument posterior to the third pair of sternal setae

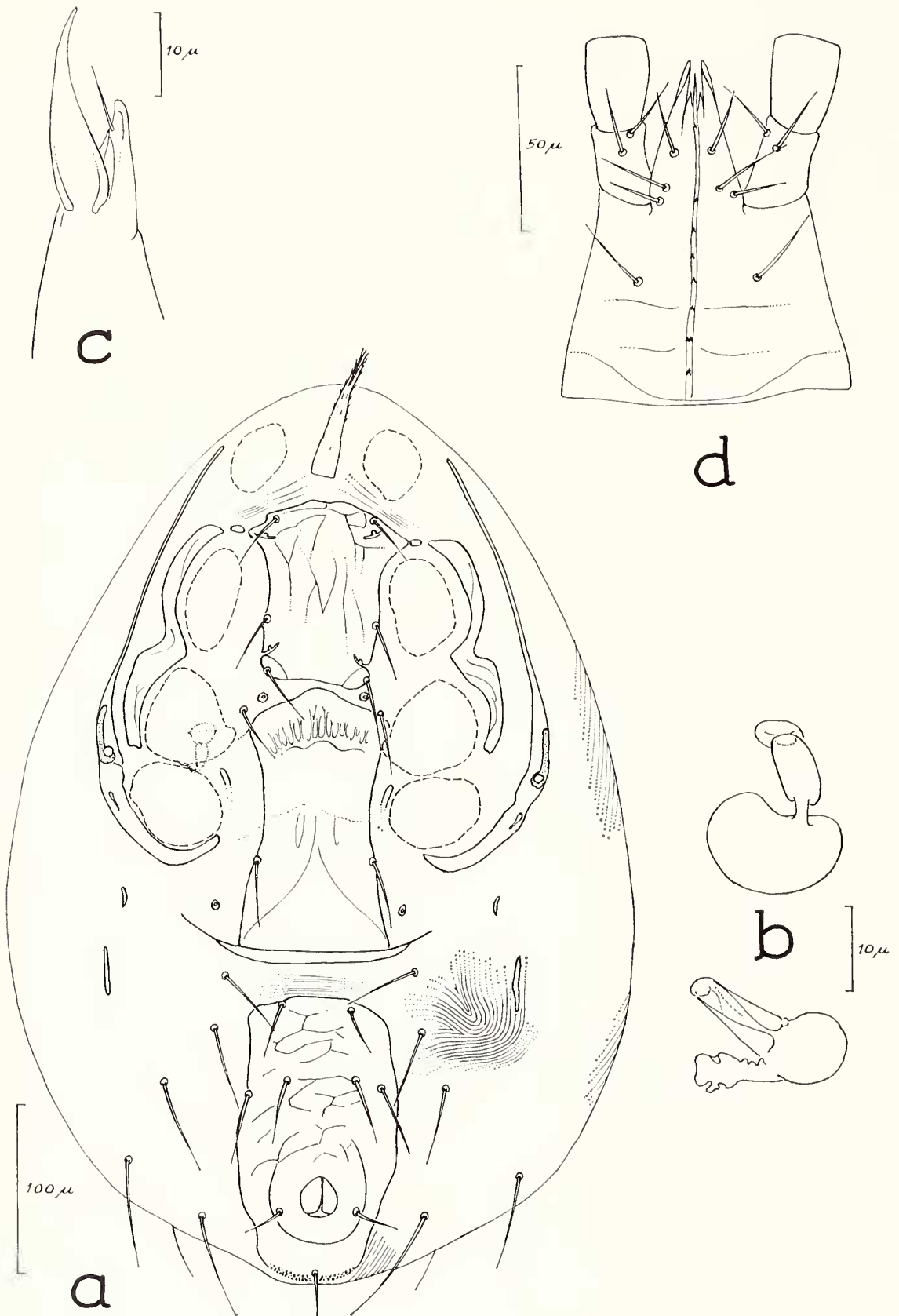


FIG. 2. *Blattisocius patagiorum* n. sp.; a, ventral surface of idiosoma of holotype female; b, spermathecae, showing variations in form, that in the lower figure partly collapsed; c, right chelicera of female; d, gnathosoma of female.

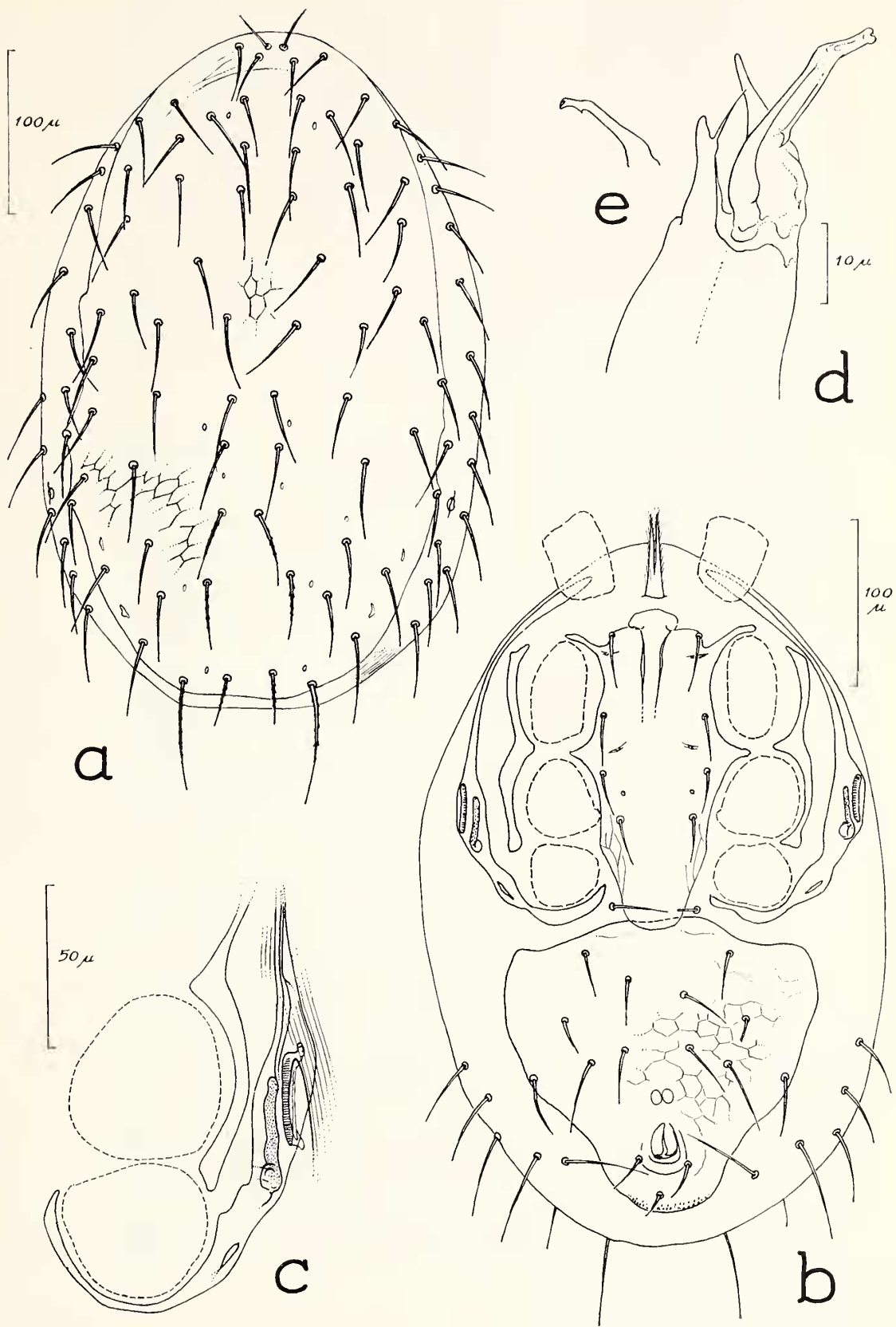


FIG. 3. *Blattisocius patagiorum* n. sp.; a, dorsal surface of idiosoma of allotype male; b, ventral surface of idiosoma of male; c, left peritreme and accessory organ of allotype male (compare Fig. 4); d, tip of right chelicera of allotype male; e, spermatodactyl of another male at lower magnification and positioned so as to show ventral projection near tip.

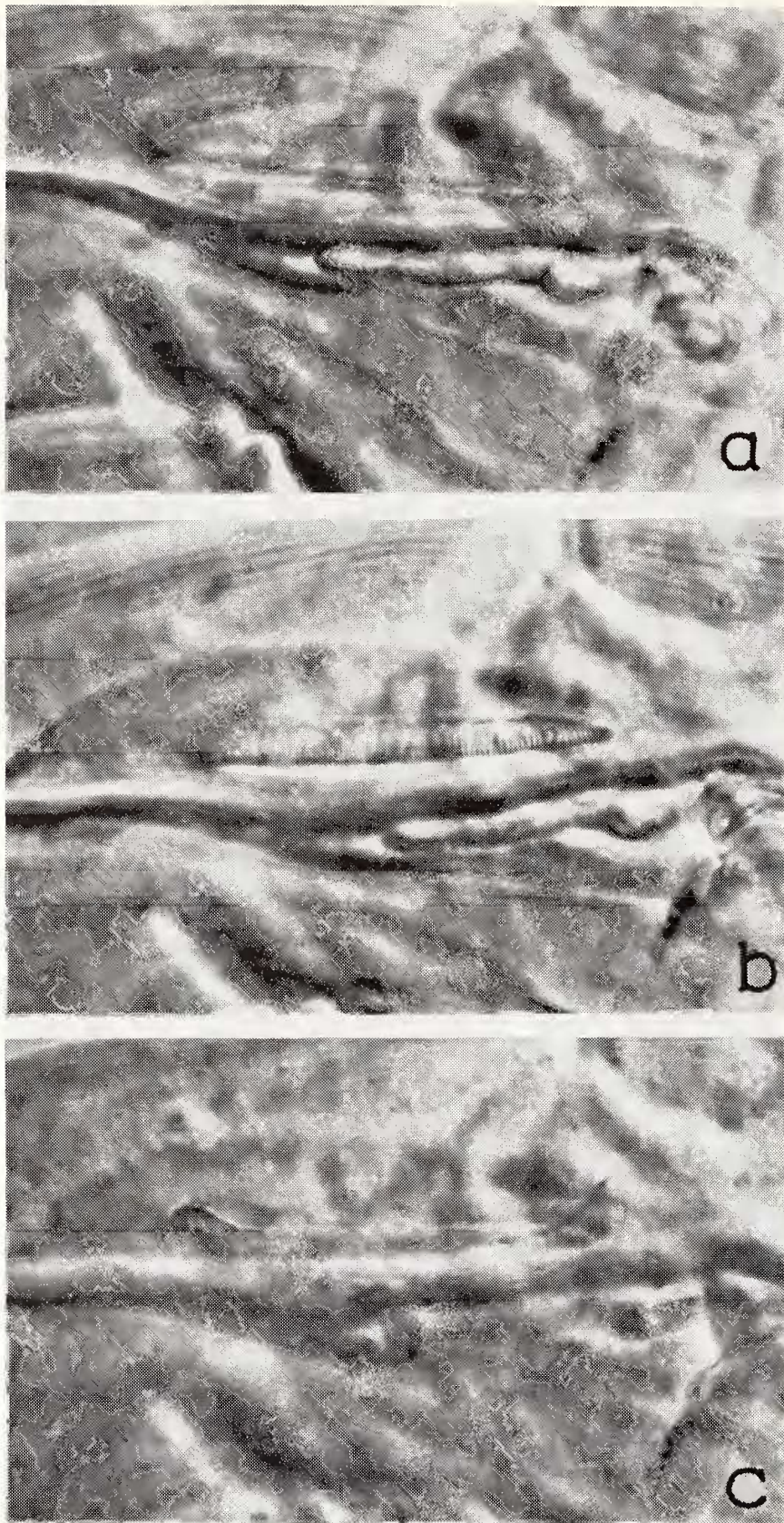


FIG. 4. *Blattisocius patagiorum* n. sp.; dark phase contrast photographs of left accessory organ of allotype male at different focal levels; a, ventralmost level: the arc at the lower border of the striated integument in the upper part of the figure appears to be the lateral lip of a fold or pouch covering the deeper portions of the organ; b, intermediate level, showing fusiform portion of organ with transverse ridges or folds; c, deepest level, showing the canoe-shaped portion. The finger-shaped object below the accessory organ in a and b is the left peritreme.

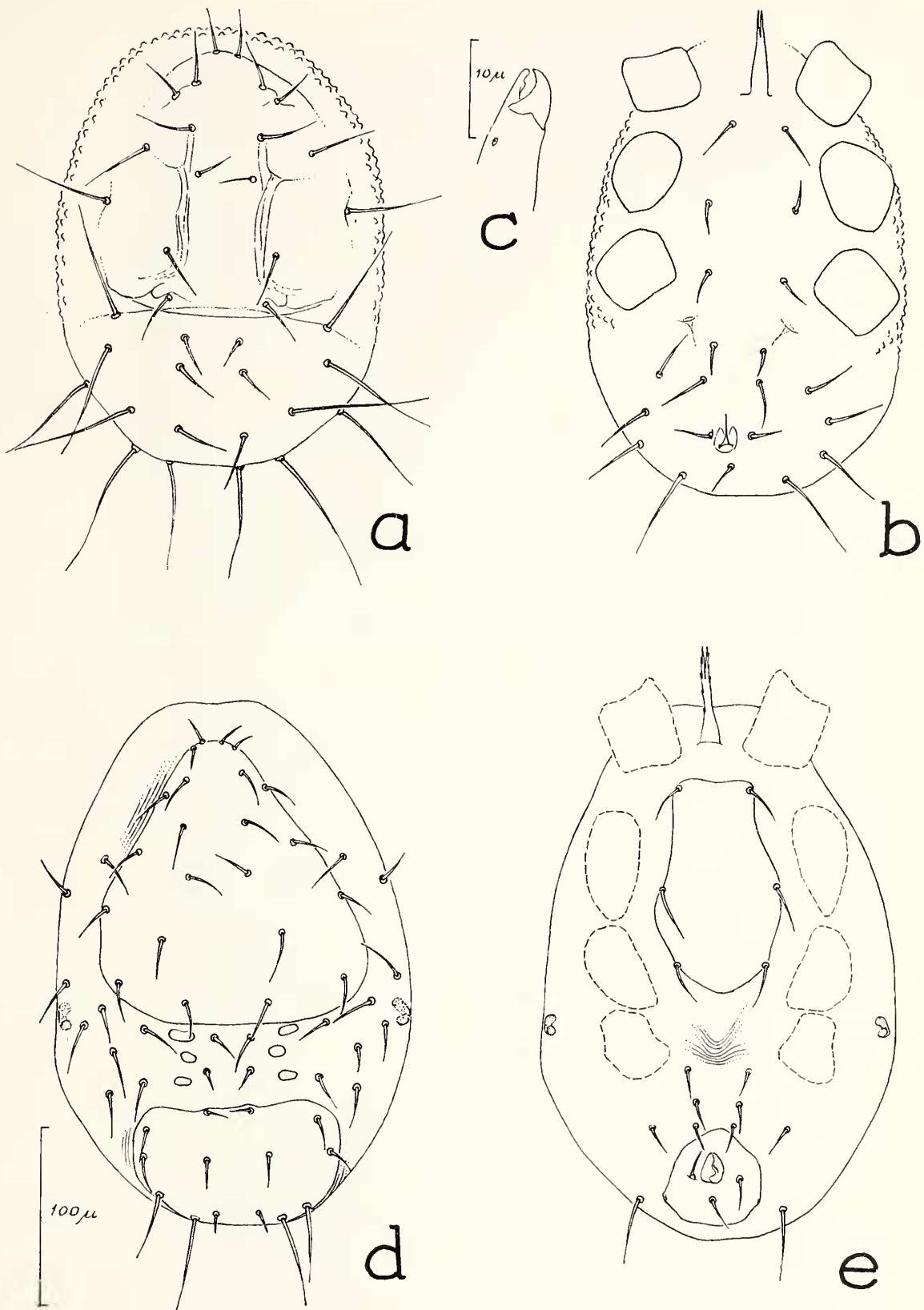


FIG. 5. *Blattisocius patagiorum* n. sp.; a, dorsal surface of idiosoma of larva; b, ventral surface of idiosoma of larva; c, tip of right chelicera of larva; d, dorsal surface of idiosoma of protonymph; e, ventral surface of idiosoma of protonymph.

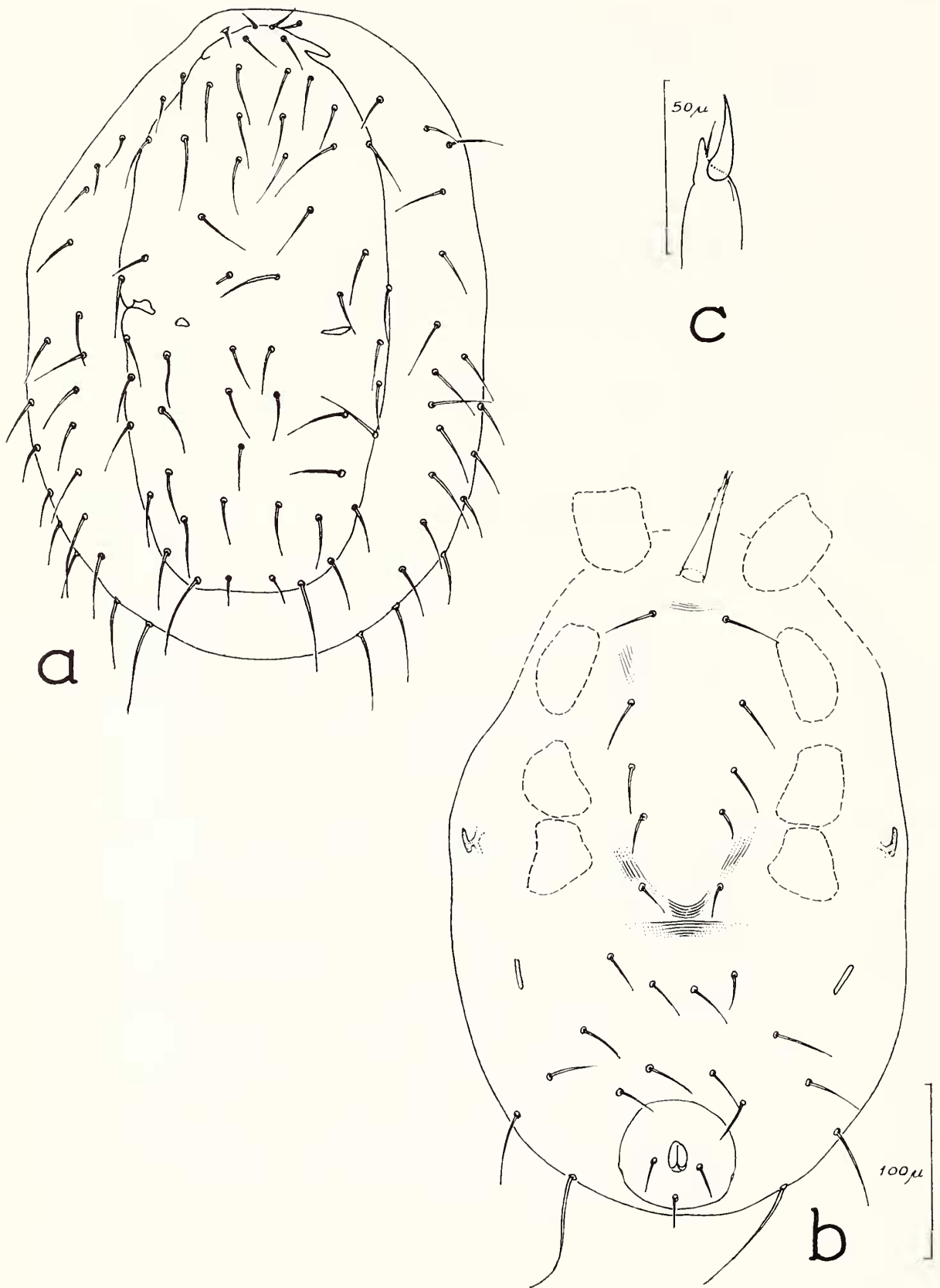


FIG. 6. *Blattisocius patagiorum* n. sp.; a, dorsal surface of idiosoma of deutonymph; b, ventral surface of idiosoma of deutonymph; c, right chelicera of deutonymph.

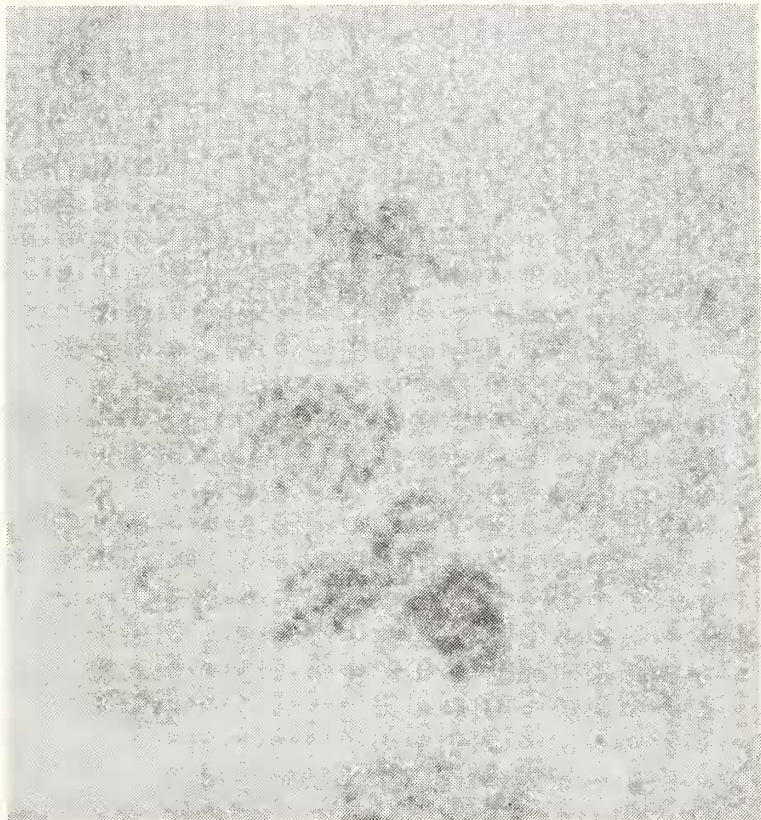
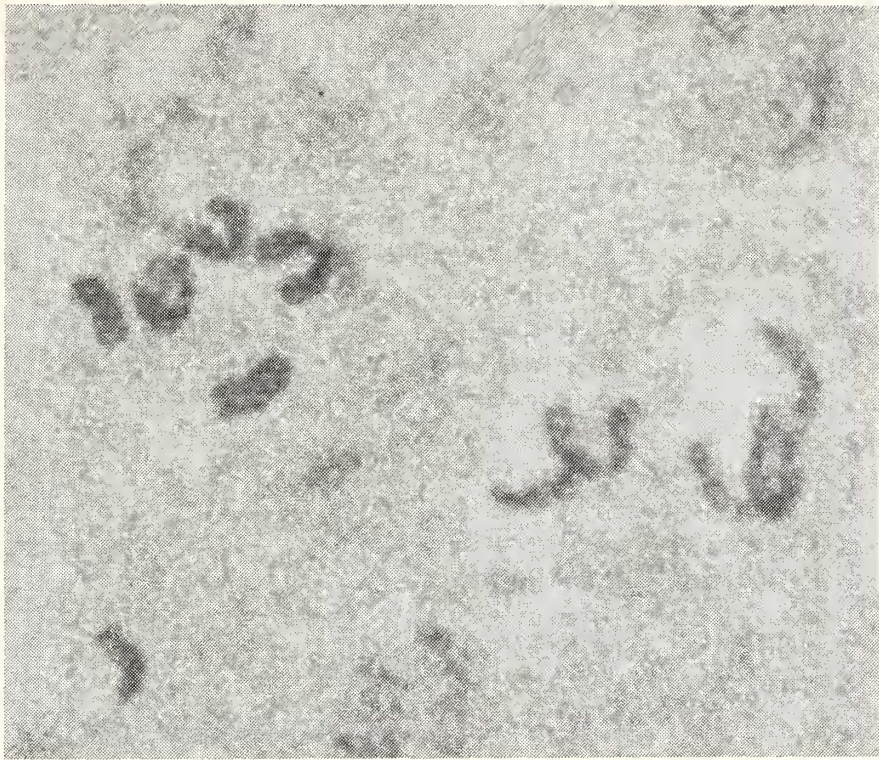


FIG. 7. *Blattisocius patagiorum* n. sp.; chromosomes from aceto-orcein squash of an embryo of undetermined age.

(Fig. 5b). The protonymph (Fig. 5d, e) has the two setae typical of the genus on the palpal trochanter. The soft cuticle is striated in the nymphal and adult stages, and does not show the coarse granulations seen in the larvae. In the deutonymph (Fig. 6) the dorsal shields are united, but with some indication of the line of fusion.

TYPE MATERIAL The above description is based upon 6 females, 5 males, 1 deutonymph, 12 protonymphs, 2 larvae, and 6 eggs, all collected or reared from moths taken in Tyringham, Berkshire County, Massachusetts. One male was found on 24 July, 1958, the other specimens during July, August, and September, 1965. Additional specimens have been taken from pinned moths collected in Giles County, Virginia, in 1956 and now in The American Museum of Natural History. These comprise 2 males, 2 deutonymphs, and 1 protonymph. Moths of the following species, all noctuids, have been found infested: 4 females and 1 male of *Spaelotis clandestina* Harris; 1 male and 1 female of *Pseudospaelotis haruspica* (Grote); 1 male of *Amphipyra pyramidoides* Guenée; 1 female of *Septis lignicolora* (Guenée). The number of mites per host varied from one to eight. The holotype is from a female of *Pseudospaelotis haruspica* found among porch sweepings in Tyringham, Massachusetts, on 31 July, 1965. The allotype male is from the same host; it was observed in copula with a female (not the holotype) on 4 August, 1965. Both holotype and allotype are in The American Museum of Natural History. Paratypes will be sent to the United States National Museum, the Canadian National Collection in Ottawa, and the Institute of Acarology at Columbus Ohio.

APPEARANCE AND BEHAVIOR The mites were found on the thorax of their hosts, typically facing forward and head down among the hairs and scales on or just behind the patagia. It was this that suggested the specific name **patagiorum**. As each mite pushes its way down among the hair and scale bases, it creates a temporary, funnel-shaped burrow, at the mouth of which the rear end of the mite can be seen. Adults and deutonymphs are yellow, as is the hemolymph of the host; the earlier stages, at least until feeding begins, are transparently white. The females are somewhat glossy when engorged. The dorsal shield is nearly flat, giving the living mites a rectangular profile in side view. In contrast to more heavily sclerotized ascids, these mites succumb quickly when placed in alcohol or lactic acid.

One of the hosts, a female *Spaelotis clandestina*, survived for more than two months after its capture on the 19th of August, while its mites completed one whole reproductive cycle. This moth was kept at room temperature in a 9 cm plastic petri dish with about six square cm of bibulous paper, moistened occasionally to prevent excessive drying. Although I offered the moth a soaked raisin from time to time, I never saw it drink or take any food. It was active only when disturbed, and was probably uninseminated. Two other host moths oviposited during captivity, and in one instance the eggs proved viable.

The mites, as a rule, moved about but little, spending many hours or days in a single "burrow." At intervals ranging from a few seconds to a minute or more, there was a moment of activity for which I can think of no better term than "bustling." It was impossible to see exactly what the mite was doing at such moments, because its fore parts were always hidden among the hairs of the host. There were leg movements and slight shifts of stance without any resulting change of location. I got the impression that the bustling mite was trying to push more deeply among the hair bases, perhaps seeking closer contact of the mouthparts with the host's surface. At no time, however, did there appear to be any fixed attachment of the mite to the moth.

When removed from its burrow and transferred to a glass observation tube, a mite would wander at random in a way somewhat similar to that of a moth ear mite, *Dicrocheles phalaenodectes* (Treat, 1965), but with slower and more deliberate gait. The forelegs were kept low and were used to palpate the substrate, only occasionally being lifted into the antennal position. A mite experimentally transferred to a fresh host would soon start to burrow among the thoracic hairs, often with jerky, thrusting movements reminiscent of *Dicrocheles*. Occasionally a mite would leave its burrow spontaneously and wander about the thorax for a time before making another burrow, usually not far from the first. Both sides of the moth were used freely.

The act of defecation resembled that in the moth ear mite except that the anus being ventral or subventral rather than terminal, the fecal droplets were left on the floor of the burrow rather than upon objects directly rearward. Spherical white or pale yellow fecal pellets sometimes accumulated about the mouth of a burrow. These were dry and powdery after dehydration, not waxy or gummy as are those of the moth ear mite. Eventually these pellets disappeared, perhaps being dislodged by movements of the mite. A burrow that had been occupied for several days had its flooring hairs or scales lightly stuck together, though not matted or tangled. It may be some component of the feces that causes this sticking. Examined microscopically, the feces were seen to comprise a yellow, water soluble component and globular or twined guanine granules averaging about 1.5μ in diameter.

Although no controlled experiments were performed, the mites showed no obvious sensitivity to light. Bustling continued in bright light from a microscope illuminator as well as in the dimmest window light that would allow the mites to be seen. Heat and moisture sensitivity were not tested. On one occasion, within a period of less than eight hours, a mite that had been transferred to a fresh host in a separate petri dish found its way back to the original host. During this time the two dishes had been stacked in a dark box, with their covers raised at one edge by the thickness of a single sheet of bibulous paper.

A surprising observation was that at times adult mites in their burrows reacted repeatedly and consistently to ultrasounds. This was first noted while I

was testing a host moth with a Galton whistle. The moth showed no reaction, but at each blast of the whistle the mite lurched forward and then made several leg movements. The reaction occurred regularly in tests made at various intervals over a period of several days. It was also tested and confirmed by another observer experienced in insect acoustics, Dr. K. D. Roeder of Tufts University. In one instance the mites continued responding to the sounds for several hours after the death of their host, thus eliminating the possibility that the response of the mites was secondary to some unobserved reaction on the part of the moth. Air turbulence as a possible artefact stimulus was ruled out by substituting an electrically driven Rochelle salt crystal for the Galton whistle. This produced pure ultrasound with no air blast or audible component. In the rated range of 32 to 44 Herz it proved an effective stimulus, while outside that range it evoked no response. It was not possible at the time to monitor this sound source or to check its intensity. No reaction was seen in mites that were already active at the time of stimulation, or in mites that had been placed upon a smooth substrate. In the absence of any known or suspected auditory organ, and with no obvious advantage to the mites in possessing such an organ, it seems reasonable to speculate that the effective stimulus for the observed responses was the acoustic displacement of some of the host's setae in contact with the mite, and that the apparently auditory reactions were in fact mediated by primarily tactile receptors, possibly by the mites' own setae. No such responses have been seen, though often sought, in the moth ear mite.

REPRODUCTION Living males are not easily distinguishable from females except under high magnification. Their general behavior is similar except that the males move from place to place a little oftener than the females. Encounters between one mite and another did not ordinarily evoke much observable reaction. Even mites of other species (*Dicrocheles phalaenodectes* and *Lasioseius* sp.), when placed experimentally upon a moth infested with *B. patagiorum*, were allowed to enter a burrow and to climb over the occupant without opposition. I witnessed copulation three times: once (15 September) from its beginning, and twice (4 August and 13 September) when already in progress. A few apparent but unsuccessful attempts were also observed, in which a male climbed upon the back of a female but then dismounted and went elsewhere. On 15 September a male that had already been in copula with a mite on another moth was transferred to a second host carrying two mites, both probably virgin females though one might still have been a deutonymph at this time. The male approached a burrow on the left patagium, containing one of the mites, but then turned away to wander over the moth's left tegula and forewing. He soon returned to the same burrow, but again left without entering. At 5:15 PM, five minutes after his transfer to the second host, the male found and entered a burrow on the right patagium, containing the second female. He immediately crept under her, embracing her

opisthosoma with legs III and IV, his mouthparts at the level of her genital region. Except for slight movements the mites remained quietly in this position for at least three and a half hours. It was not possible to see whether or not a spermatophore was transferred. At 10:20 PM the male was seen leaving the dorsal side of the female, after which he wandered over the moth for a few minutes and was then transferred to alcohol. Five days later his mate, then fully engorged, had left the moth and was lost. She had laid no eggs.

The previous mating of the same male with another female on the earlier host had been followed by oviposition within 36 hours. In this case the female had been the only occupant of the moth from its discovery on 19 August until 12 September, when the male was transferred to it from a moth of another species (*Amphipyra pyramidoides*). On the following day the mites were seen in copula, and on 15 September the female laid the first of about 30 eggs. The last egg was laid on 28 September, but the female survived until the death of the host, three weeks later, at which time the mite was mounted for study. Intervals between successive eggs varied from about four to more than twelve hours, the average being probably about eight hours. The temperature varied considerably during the period of oviposition; at the time of four-hour intervals it was about 30° C.

On 18 September I watched, under 42.5X magnification, the laying of the tenth egg, and made the following notes. "At 3:30 PM bustling movements were occurring every three or four seconds, but they became less frequent until by 3:50 the mite was quiet for a minute or more at a time. She was well engorged, with no depression of the ventrianal plate. Her white, nodular malpighian tubules showed intermittent undulations, some beginning proximally (nearest the rectum, which was full of white matter) and some distally, the former being the more frequent. There were also elongations and shortenings of the malpighian tubules, but no translational movements of the nodes. At intervals of a minute or more the ventrianal plate was deeply depressed, most markedly on the left side, where also, a large ovoid white mass could be seen through the dorsal surface. I thought at first that this mass was the tenth egg, but this proved incorrect, for it was still there after the tenth egg had been laid. It may have been the eleventh. Twice there were movements that suggested compressional straining. At 4:10 PM the gnathosomal end of the mite was slowly lifted up as the egg was passed forward. This egg emerged more slowly than a *Dicrocheles* egg but was free within about five seconds after the movement began. The ventrianal plate was deeply depressed at this time, and remained so until about 4:30, when the opisthosoma was regaining its distended form through re-engorgement or otherwise. Immediately after the egg was free, the mite caressed it a few times with her forelegs and palpi, but then moved aside slightly and began a series of jerky, thrusting movements toward the depths of the burrow, which had the effect of shifting the egg rearward along her left side. She then probed deeply into the

burrow and became quiet, possibly feeding, until about 4:30 PM, at which time the usual bustling was resumed."

The eggs adhered only lightly to the host, and if not removed experimentally were lost from the moth within a few hours. Their surface was dry, and they were often electrostatically repelled by the needle when I tried to pick them up. They hatched in from one to three and a half days, probably depending upon the temperature. The last four shrivelled and failed to hatch.

I squashed ten of the eggs in aceto-orcein, but although the chromosomes stained fairly well I could not determine the chromosome number unequivocally. In many of the cells there were two short, straight chromosomes, two straight ones of intermediate length, and two long V- or C-shaped bodies, which, if these last were single units, would give a chromosome total of six, but if double (i.e., actually two chromosomes each), a total of eight. I think six is the more likely number. Some cells, however, appeared to have only three, and some four chromosomes, while others seemed to be polyploid. All of the embryos yielded similar squashes; there was no sign of "commas" or sex chromatin masses as in males of *Dicrocheles* (Treat, 1965).

The larvae were water white. They moved with a rhythmic, swinging gait, with legs I in the antennal position. When placed on a moth, some larvae, after a momentary freeze of ten seconds or more, began to wander superficially over the scale tips. These were soon brushed or flicked off by sudden movements of the moth. Other larvae burrowed among the scales much as do the adults, but farther back on the thoracic disc. These remained on the host and within a few hours transformed into protonymphs, leaving their exuviae on the floor of their burrows. Evidently feeding is not necessary in the larval stage, because protonymphs were produced from larvae kept in glass vials without food.

The protonymphal stage varied in duration from a few hours to two days, and in the longer period at least, involved some feeding. The deutonymphs became yellow and engorged, and in this condition were not easily distinguished from adults. In one instance, transformation to the adult occurred after a deutonymphal stage of four days, the total time from egg to adult in this case being ten days. Molting was not observed directly, but in all instances the cast skins were left on the floor of the burrow.

DISCUSSION

The details given above raise questions with regard to the relationship between these mites and their noctuid hosts. Are the mites to be considered parasites, or are they not? And if not, what then? Certainly the association involves something more than phoresy. The long survival period, the ability of the female to produce many viable eggs, and of the offspring to reach adulthood on the original host, all indicate a source of food either in or on the host itself, although the

failure of the eggs to adhere to the host suggests that in nature the earliest stages, at least, may be passed elsewhere.

For the instars actually associated with moths, whether regularly or only occasionally, commensalism in the strict sense is unlikely, since the moths under observation took no food and were not dusted with pollen. The remaining possibilities are parasitism and phagophily—the use of other symbionts as food. If these mites were phagophiles, they certainly did not feed upon other mites, since none was present except when one or two were placed upon the moths experimentally, and these were ignored by the *Blattisocius*. Conceivably the food was some kind of microorganism. To be sure, the long-surviving host (numbered 85 for identification) occasionally had small patches of white mycelial growth upon its thorax. The hyphae were septate and bore spores of various sizes on short conidiophores. But this bloom was apparently ignored by the mites, and it disappeared when the humidity was reduced. The patagia of some arctiid moths give out a repugnatorial secretion, but no such secretion has been seen or described in the noctuids with which we are concerned.

Some months after moth number 85 had been injected with alcoholic Bouin's solution, I denuded the patagia and examined them microscopically. Along their dorsal margins, in places previously occupied by the mites, were several minute, dark brown discolorations. Under high magnification these appeared to be limited to the goblet-like bases of individual scale sockets. The bustling activities of the mites, the stylet-like shape of their movable chelae, and the appearance of their midgut and rectal contents suggest that the food is hemolymph which exudes from minute punctures in the host's cuticle, possibly through the scale bases. The bustling movements might be concerned with removing plugs of coagula and releasing a fresh supply of the liquid. This notion is, of course, wholly speculative and may prove quite incorrect. According to Lindquist and Evans (1965), "No ascid mites are known to be truly parasitic."

If *B. patagiorum* were shown to be a true parasite, the questions would still remain whether its parasitism is facultative or obligate, and whether the choice of hosts is restricted to moths. Other species of the genus have been reported from many different hosts and habitats including lizards, birds' nests, mammals, and various kinds of moths and other insects, particularly those infesting stored grains (Hughes, 1961). I have found *B. dentriticus* on the noctuid *Pseudaletia adultera* (Schaus) from Pelotas, Brazil, and also on a notodontid, *Datana ministra* (Drury) from New Jersey. I have found *B. keegani* on this same species of notodontid, on the noctuids *Polia contigua* (Schiff.) from Kyoto, Japan, and *Zale lunata* (Drury) from Charleston, South Carolina, and on a tineid, *Tineola biselliella* (Hum.) from Pittsburgh, Pennsylvania. I have taken *B. tarsalis* from the noctuids *Crymodes devastator* (Brace) from Salt Lake City, Utah, and *Epizeuxis aemula* (Hbn.) from Tyngham, Massachusetts. In several

instances (e.g., Rivard, 1960) *Blattisocius* species have been shown to be predators on other mites, though capable of living also upon molds.

It is noteworthy that the hosts of *B. patagiorum* as recorded on page 152, though representing two more or less divergent noctuid subfamilies, have this in common—that they characteristically rest by day in crevices under the bark of dead trees or in dead wood, often in the joints and crevices of buildings. Such situations favor mite populations of various kinds, and could be expected to yield occasional examples of disjunctive or facultative association between some of the regular occupants and casually intruding moths. I have come across other instances of such association, involving various gamasines, particularly ascids of the genera *Proctolaelaps* and *Lasioseius*, which I hope to report elsewhere. It is interesting to note that notwithstanding the latitude in the selection of host species suggested by these records, there is considerable restriction in a given species of mites with regard to the part of the host's body that is occupied. *Blattisocius patagiorum*, for example, is recorded only from the thorax of the host, and usually from its dorsal surface. My specimens of *Proctolaelaps* and *Lasioseius*, by contrast, regardless of the moth species on which they were discovered, have almost invariably been found between the palpi, under the base of the proboscis. This consistency in site selection might argue some degree of regularity in the association of the mites with moths, but it could also be merely the result of inherent differences in responsiveness to tactile or other stimuli, which, though perhaps adaptive in some other context, might lead to relatively meaningless differences in the sites occupied on casually or accidentally boarded hosts. Many more collection records and behavioral studies will be needed to resolve such problems. In any event, it seems unlikely that the mites in question significantly reduce the life span or population density of their noctuid associates.

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